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Stem Cells: A Guarantee for Human Survival: A Review Mohammadi Hospital in Bandar Abbas from March 2013 to December 2013

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ABSTRACT

In the multicellular body of living creatures some cells help the survival of others through their own proliferation. They are called stem cells which are in fact undifferentiated biological cells capable of converting into other cells. They do exist in different body organs such as blood, bone marrow, skeletal muscle, retinal, cornea and pulps. Their prevalent clinical use is the treatment of ontogenesis imperfecta, brain damage, Parkinson's, improving blood production and bone reconstruction. In this research, academic articles previously published were reviewed and highly valid scientific websites were visited in order to gather the data. Every multicellular organism requires a correct functioning and reconstruction of damaged cells to continue its life. Some cells which are differentiated from others are able to convert into other cells even the indivisible ones such as brain and spinal cells. In the case of injuries which are not reparable naturally by the tissue cells themselves, these cells come to help to reconstruct them as well as the damaged tissue. Therefore, a human being is enabled to survive.

Keywords: Stem cells, cell, cell Division, Adult Stem Cells, Embryonic Stem Cells.

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INTRODUCTION

In multicellular organisms' body, a group of cells are in charge of the organism's survival. Among these cells are stem cells(1, 2). These are a kind of undifferentiated somatic cells which are capable of constant proliferation and reproduction in the cultivation environment in an unlimited course of time(3, 4). Under certain circumstances, they can turn into specified cells and get differentiated as different types of constructive body cells (4-6). Moreover, they can be used to produce cells and finally different tissues in an organism's body(4, 7).

This capability of theirs is a function of their developmental genes which enable them to function exactly as inside an organism's body even when they are in a prepared cultivation context. By producing different proteins, they would increase cell's differentiation in order to convert into specified cells(8, 9).

Stem cells are multifunctional and very potent. Their potential is the core of the attention they attract (9-11). Among their characteristics mention can be made of self-renewal, high mitotic division, clone production ability, differentiation power to different types specified cells(2, 12) and creation of a restorative cell population(2, 13, 14). As for their origin, stem cells are divided into two primary types of embryonic and adult(2, 15).

Limitations in the use of embryonic stem cells encouraged scientists to conduct more research in adult stem cells. Adult stem cells are undifferentiated cells whose primary role is to support and restore tissues from which they are derived. These cells exist in blood, bone marrow, skeletal muscle, retinal, cornea, pulp, brain, spinal cord, liver, skin, intestine, pancreases and vein blood(4, 16, 17).

Friedenstei's studies revealed that bone marrow, besides blood producing stem cells which are in charge of making various blood cells in body(4, 17)similar to bone and cartilage(18, 19). Afterwards, wider research indicated that mesenchymal stem cells have a trivalent differentiation power. In other words, besides bone and cartilage these cells can be differentiated to fat type cells too. Today, a trivalent differentiation power is known as a golden standard in, contain scaffolds [mesenchymal stem cells] capable of cloning. Then, the primary feature of these cells was stated to be their differentiation to clones recognizing and proving the mesenchymal nature of stem cells (10, 19-21).

Among the most important adult stem cells which has attracted the attention of researchers' are mesenchymal stem cells(2, 15). For the first time, these cells were divided by Friedenstein & et al. [1992], and only later they were divided by other researchers based on their adhesion to the cultivated tissue surface(4, 18, 22, 23). Mesenchymal stem cells are multivalent cells capable of differentiation into such connective tissue lineages as adipocyte, chondrocyte and osteocyte. These cells are capable of renewing their division for a long time and maintain their differentiation power meanwhile (10, 24, 25).

This researcher refers to a number of features for these cells: they comprise a low percentage of bone marrow; they have a high proliferation power in vitro; they are clone producing; they produce dense clones of different shapes; they are capable of producing bone even after passing through multiple passages(25-27).
Mesenchymal stem cells can proliferate simply. That is due to: their renewal ability and power of differentiation into skeletal tissues(25, 28), the fact that they can readily be extracted from bone marrow samples, and that they can easily proliferate under cultivation circumstances. They are, therefore, considered as appropriate cells to be used in studies of gene therapy, cell therapy, tissue engineering especially bones (19, 29, 30) and transplants (4).

Yet another characteristic of mesenchymal stem cells is their freezing and melting potentials. Even after these conditions, they are able to proliferate and be differentiated into mesenchymal cells [9, 65-66]. With regard to these characteristics, researchers have considered mesenchymal stem cells as proper cells in the service of survival and therapeutic effects(4, 31).

Stem cells would produce a range of different cells essential for restoring an injured tissue or organ. Their common clinical use is such fields as: osteogenesis imperfecta, brain damage, Parkinson's(4, 32), blood

production improvement, bone reconstruction, treating joint diseases(25, 28, 33-38), heart infarction, fracture improvement, tendon rupture, cartilage restoration, treating liver failure, and other body disorders(4, 32).
On the other hand, investigations have revealed that these cells can convert into mesenchymal stem cells which are of a high flexibility(19, 37, 39-41). The elasticity of these cells and their conversion into nerve cells, skin cells, lung, liver, kidney and spleen cells has been approved(25, 39, 40). Research has also attested to their power of turning into the cells of any damaged body tissues (4, 42, 43).

Despite the significant role of mesenchymal cells in cellular therapy, still some of their biological traits are unknown such as cellular nature, evolutional origin and there in vivo functioning(25, 44). Answering such questions and applying mesenchymal cells to treat human diseases requires pre-clinical studies on animal models. In order to study these cells, the first step would be to extract them and proliferate them from bone marrow cells. Tests on animals with this concern have been successful (25, 45-53). So far, these cells have been extracted from human beings and some animal types(10, 19-21, 29, 30, 35, 37, 39-41, 47, 54, 55) such as cow, pig, goat and sheep(4, 56-60).

METHODOLOGY

In this mini-review, the literature search comprised the most available databases in Iran including Google Scholar. The terms and keywords included Stem cells, cell, cell Division, Adult Stem Cells, Embryonic Stem Cells. The search strategy was limited to available free full text articles in English language and published during 1970 to 2014 in the world. Additionally, unpublished abstract from symposium or conference or only abstract available, clinical trials and review articles did not include in the study.

CONCLUSION

Every multicellular organism requires a correct functioning and reconstruction of damaged cells to continue their life. A group of cells termed as stem cells can differentiate into other cells, even the undividable ones such as brain and spinal cells. In fact, stem cells are undifferentiated cells that can turn into other cells. Among their other idiosyncrasies are their self-restoration power, high mitotic divisibility and cloning ability. With the help of these extraordinary capabilities, these cells can repair cellular damages which cannot be naturally repaired by the tissues. By restoring these cells and repairing the damages the tissue can continue to live on and this is followed by human survival.

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